



VALID UNTIL 5/4/07

## APPENDIX 5 - COMPRESSION IGNITION OFF-ROAD EQUIPMENT

Below is additional information pertaining to the Compression Ignition Off-Road Equipment category under AQMD's FY 2007 Carl Moyer Program (CMP). All information in PA# 2007-08 and this Appendix apply. For additional detail regarding this program category, refer to CARB's 2005 CMP Guidelines. In the case of any conflict between CARB guidelines and AQMD criteria, the more stringent criteria will prevail.

Applicants are further cautioned that CARB recently adopted a Fleet Rule for cargo handling equipment (CHE). Depending on the status of a regulated entity's fleet rule compliance, CHE may no longer be eligible for CMP funding. Projects for applicants subject to the ARB Fleet Rules will be evaluated on a case-by-case basis to determine if there are any surplus emissions that remain eligible for CMP incentives. Special data submittal requirements apply and are indicated in Attachment 1 of the Application Forms.

It is the Applicant's responsibility to check with AQMD's CMP web page for program clarifications, changes and updates. This page may be accessed at [http://www.aqmd.gov/tao/implementation/carl\\_moyer\\_program\\_2001.html](http://www.aqmd.gov/tao/implementation/carl_moyer_program_2001.html).

### CARB MOYER PROGRAM RESOURCES

Applicants are highly encouraged to review CARB guidelines for additional requirements of the CMP. CARB guidelines are incorporated into AQMD's Moyer Program by reference. 2005 CARB guidelines may be downloaded from:

<http://www.arb.ca.gov/msprog/moyer/guidelines/revisions05.htm>

On this web page, there are links to the four parts of the CARB 2005 CMP guidelines. These parts are described below for easy reference.

- Part I provides the Executive Summary, Program Overview and Administrative Requirements (primarily applicable to air districts) for CARB's Carl Moyer Program. The link to Part I is [http://www.arb.ca.gov/msprog/moyer/guidelines/2005\\_Carl\\_Moyer\\_Guidelines\\_Part\\_1.pdf](http://www.arb.ca.gov/msprog/moyer/guidelines/2005_Carl_Moyer_Guidelines_Part_1.pdf)

- Part II provides the Project Criteria for each program category. The link to Part II is [http://www.arb.ca.gov/msprog/moyer/guidelines/2005\\_Carl\\_Moyer\\_Guidelines\\_Part\\_2.pdf](http://www.arb.ca.gov/msprog/moyer/guidelines/2005_Carl_Moyer_Guidelines_Part_2.pdf)
- Part III provides the Agricultural Assistance Program guidelines. Link to Part III at [http://www.arb.ca.gov/msprog/moyer/guidelines/2005\\_Carl\\_Moyer\\_Guidelines\\_Part\\_3.pdf](http://www.arb.ca.gov/msprog/moyer/guidelines/2005_Carl_Moyer_Guidelines_Part_3.pdf)
- Part IV is the Appendices section of the guidelines. The link to Part IV is [http://www.arb.ca.gov/msprog/moyer/guidelines/2005\\_Carl\\_Moyer\\_Guidelines\\_Part\\_4.pdf](http://www.arb.ca.gov/msprog/moyer/guidelines/2005_Carl_Moyer_Guidelines_Part_4.pdf) . This section includes the following Appendices.
  - Appendix A – Acronyms
  - Appendix B – Tables for Emission Reduction and Cost-Effectiveness Calculations
  - Appendix C – Cost-Effectiveness Calculation Methodology
  - Appendix D – Example Calculations
  - Appendix E – Description of Certification and Verification Executive Orders
  - Appendix F – Retrofit Emission Control Strategies
  - Appendix G – Description of Functional Equivalency of Non-Original Equipment Manufacturer Repowers and Rebuilt Engines for use in Repowers

## **HIGHLIGHTS FOR 2007**

- CARB adopted a cargo handling equipment (CHE) regulation in December 2005. This regulation applies to diesel-fueled cargo handling equipment at California's ports and intermodal rail yards. Cargo handling equipment is used to transfer goods and includes equipment such as yard tractors (hostlers), rubber tire gantry cranes, top handlers, side handlers, forklifts, loaders, and mobile cranes. CARB staff is still working to specify Carl Moyer Program project criteria for this equipment. Consequently, CHE projects will be evaluated on a case-by-case basis, and additional fleet information is required. Part Two of Attachment 1 of the AQMD Application Form requires that **all** applicants subject to an ARB Fleet Rule (i.e., cargo handling equipment, transit, solid waste collection vehicle, public fleets, etc.) must provide the information requested therein. The application will not be considered until ARB evaluates this information and indicates to the district that the proposed project is indeed surplus to the regulation. The applicant is free to submit this information in advance of the application due date; AQMD will facilitate early ARB review of this information in order to determine program eligibility in advance of application preparation. A letter from CARB indicating the applicant is in compliance with applicable fleet rule(s), that also indicates the eligibility terms for the proposed project is acceptable, in lieu of the information required in Attachment 1, Part Two.

- CARB is developing a control measure to reduce diesel particulate matter emissions from in-use, off-road, diesel-fueled, mobile equipment greater than or equal to 25 horsepower. This includes, but is not limited to, construction equipment, mining equipment, airport ground support equipment, and industrial equipment such as forklifts. The proposal will not cover equipment used in agricultural operations, cargo handling at ports and intermodal rail facilities, or equipment already covered by an in-use rule or agreement. This item is scheduled to be heard by the Board in May 2007. If approved, it will likely affect project criteria for off-road projects.
- Applicants proposing Tier 2 or Tier 1 engine repowers must provide documentation from the engine manufacturer stating why the equipment can not be repowered with a Tier 3 engine. See additional discussion related to this issue below. Applications submitted without this documentation may not be evaluated. Please note that AQMD will give priority to Tier 3 and Tier 2 projects, regardless of cost-effectiveness.
- Engine repower projects must include a verified diesel emissions control system (VDECS) if cost-effective, available and technically feasible. All repower projects will be evaluated on a level playing field against the \$5,000 per weighted ton cost-effectiveness limit for the off-road construction category. If a VDECS is determined to be available, the cost of the VDECS is eligible for CMP funding up to the overall cost-effectiveness limit of \$14,300 per ton of weighted emissions reduced for the combined project (Repower plus retrofit). Note that all repower projects will be ranked based on the cost-effectiveness of the repower only portion of the project and once selected, additional funding will be added (up to a \$14,300 per ton limit) to the grant award to cover the VDECS cost. Also note that repower projects with VDECS will be limited to a 5 year life.

## PROJECT CRITERIA

- The project cost-effectiveness limit is \$5,000 per weighed ton of NOx, PM and ROG emissions reduced. A four (4) percent capital recovery factor is used for the cost-effectiveness calculation.
- Cost-effectiveness calculations are based on particulate matter (PM10), oxides of nitrogen (NOx), and reactive organic gases (ROG). The formula established by CARB is provided below. AQMD staff will calculate the NOx, PM and ROG emissions reductions during the evaluation process.

### Annualized Cost (\$/year)

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**NOx reductions + 20(combustion PM10 reductions) + ROG reductions (tons/year)**

- Applicants **must** provide **current** vendor quotes **obtained within the last 90 days** with their application to document the incremental cost of implementing the

proposed technology. This will require documentation of both the baseline and low-emission project costs. Applicants can request funding up to the full differential cost between a reduced-emission vehicle/engine/equipment and its new base standard emission equivalent; however, less may actually be awarded, depending on the results of the cost-effectiveness evaluation.

- Applicants **must** also provide documentation that justifies the activity level projected for the vehicles (i.e., mileage logs, hour-meter records, business records, fuel receipts, etc. for the past two years).
- All projects must be operational within eighteen (18) months of contract execution, or May 31, 2009, whichever is earlier.
- The new engine/equipment/vehicle must not have been purchased prior to the effective date of the contract.
- Pre- and Post-Inspection of all engines approved for funding will be conducted as required as well as verification of engine destruction. Payment will be made only after all inspections are completed and engine/vehicle destruction is verified.
- AQMD reserves the right to disqualify any application that does not comply with all applicable requirements including submission of a complete application package (i.e., all signature documents, activity justification documentation, recent quotes, tier 2/tier 3 exemption, etc.). For Compression-Ignition Off-Road Equipment projects, this includes the main application as well as the information requested in Attachment 5 to the application.
- Verified Diesel emission control system (VDECS) such as particulate filters and diesel oxidation catalysts are eligible for funding. These retrofit devices must be verified by CARB for use on the specified off-road application. Further, in order to include NOx emission reductions in the cost-effectiveness evaluation, the technology must be verified to reduce NOx emissions by at least 15 percent compared to the original engine certification level.
- The AQMD Moyer Program will fund the cost of purchase and installation of a CARB-verified diesel emission control device, not exceeding the Carl Moyer Program cost-effectiveness limit. For retrofit projects that only take credit for NOx reductions from a Level 3 DECS (because the PM10 reductions are already required by regulation), the baseline cost is 1/2 the proposed project cost. The maximum funding for such projects would be the retrofit cost minus the baseline cost (i.e., a maximum of 50 percent of the project cost is allowed for NOx-only retrofit projects).
- The cost of the retrofit, and all filters needed during the project life, may be paid for with Carl Moyer Program funding provided it meets the weighted cost-effectiveness limit.

- Engines certified to a lower Family Emission Limit (FEL) are only eligible for Moyer Program funding as part of repower projects. In these cases, the emission standard, not the certified FEL level, will be used in emission calculations. The FEL emission level is identified on the Executive Order (EO) and is located under the emission standard.
- Part One of Attachment 1 of the AQMD Main Application Form requires that **all** repower and retrofit projects provide the vehicle identification numbers (VINs) for the project equipment in both hard copy and electronic format.
- Please review CARB's CMP Guidelines, Part IV, Appendix E for a comprehensive description of certification Executive Orders for new engines and Verification Letters for retrofit devices.

## EVALUATION METHODOLOGY

AQMD staff will evaluate all submitted proposals and make recommendations to the Governing Board for final selection of project(s) to be funded. Proposals will be evaluated based on the cost-effectiveness of emissions (NO<sub>x</sub> + ROG + 20\*PM) reduced on an equipment-by-equipment basis, as well as a project's "disproportionate impact" evaluation (discussed below). Be aware of the possibility that due to program priorities and/or funding limitations, project applicants may be offered only partial funding, and not all proposals that meet minimum cost-effectiveness criteria may be funded.

In compliance with AB 1390, Firebaugh, the FY 2006 CMP requires that at least 50 percent of the funds be spent in areas that are disproportionately impacted by air pollution. CARB has issued broad goals and left the details of how to implement this requirement to each air agency. In the South Coast Air Quality Management District, the disproportionately impacted areas are defined by a weighted formula that includes poverty level, particulate matter (PM) exposure and toxic exposure. The process is described below:

1. All projects must qualify for the CMP by meeting the cost-effectiveness limits established in the PA.
2. All projects will be evaluated according to the following criteria to qualify for Disproportionate Impact funding:
  - a. Poverty Level: All projects in areas where at least 10 percent of the population falls below the Federal poverty level based on the year 2000 census data, will be eligible to be included in this category, and
  - b. PM Exposure: All projects in areas with the highest 15 percent of PM concentration will be eligible to be ranked in this category. The highest 15 percent of PM concentration is 46 micrograms per cubic meter and above, on an annual average, or

- c. Toxic Exposure: All projects listed in the Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES II) report<sup>1</sup> as having a cancer risk of 1,000 in a million and above will be eligible to be ranked in this category.

Data for the poverty level and PM and toxic exposures were obtained from the U.S. Census, the 1998 AQMD monitoring data and Mates II study respectively.

3. Fifty percent of the funding available for this PA will be allocated among proposals located in disproportionately impacted areas. If the funding for disproportionately impacted areas is not exhausted with the outlined methodology, then staff will return to the Governing Board for direction. If funding requests exceed 50 percent of the total available funding, then all qualified projects will be ranked based on their disproportionate impact. Each project will be assigned a score that is comprised of 40 percent for poverty level, and 30 percent each for PM and toxic exposures. Proposals with the highest scores will receive funding until 50 percent of the total funding is allocated.

All the proposals not awarded under the fifty percent disproportionate impact funding analysis will then be ranked according to cost-effectiveness, with the most cost-effective project funded first and then in descending order for each funding category until the remainder of the Moyer Funds are exhausted. Some projects that exceed the cost-effectiveness ceiling may receive partial funding, depending on their rankings.

## **ELIGIBLE COSTS**

Eligible project costs (i.e., costs for which Moyer funding is requested) are limited to the incremental cost of a project to implement the reduced emission technology. Operation and maintenance costs are not eligible for CMP funding. Please refer to the Project Types section below for additional detail.

## **PROJECT LIFE**

As discussed above, a key parameter in the determination of a project's emission reduction benefit is its project life. The acceptable maximum life for calculating the project benefits of off-road equipment projects is summarized below in Table 5.1. Applicants must provide documentation to justify a longer project life.

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<sup>1</sup> Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES II), SCAQMD, March 2000.

**Table 5.1 – Maximum Project Life for Compression Ignition Off-Road Equipment**

Equipment Type	Maximum Life without Documentation
Off-road new purchase	10 years
Off-road repower	7 years
Off-road repower with retrofit	5 years
Retrofit	5 years

## **REPORTING AND MONITORING**

All participants in the CMP are required to keep appropriate records during the full contract period. Project life is the number of years used to determine the cost-effectiveness and is equivalent to the contract life. All equipment must operate in the AQMD for this full project life. The AQMD shall conduct periodic reviews of each project's operating records to ensure that the engine is operated as stated in the program application. Annual records must contain, at a minimum:

- Total hours of operation
- Total hours of operation in the South Coast Air Basin
- Annual fuel consumed (if cost-effectiveness was determined on fuel basis)
- Annual maintenance and repair information

Records must be retained and updated throughout the project life and made available for AQMD inspection. The AQMD may conduct periodic reviews of each vehicle/equipment project's operating records to ensure that the vehicle is operated as required by the project requirements.

## **COST-EFFECTIVENESS EVALUATION DISCUSSION**

Cost-effectiveness calculations are based on particulate matter (PM<sub>10</sub>), oxides of nitrogen (NO<sub>x</sub>), and reactive organic gases (ROG). The new formula established by CARB is highlighted above. AQMD staff will calculate the NO<sub>x</sub>, PM and ROG emissions reductions and apply the new formula during the evaluation process. Only CMP funds are to be used in determining cost-effectiveness<sup>2</sup>. The one-time incentive grant amount is to be amortized over the project life (which is also the contract term) at a discount rate of 4 percent. The amortization formula (given below) yields a capital recovery factor (CRF), which, when multiplied by the initial capital cost, gives the annual cost of a project over its project term.

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<sup>2</sup> Unless the AQMD "buys down" the cost of the project by adding additional funding, in which case the total grant funding amount should be used for the cost-effectiveness calculation.

$$CRF = [(1 + i)^n (i)] / [(1 + i)^n - 1]$$

where

$i$  = discount rate (4 percent)  
 $n$  = project life (at least 3 years)

Table 5.2 lists the CRF for different project lives using a discount rate of 4 percent. Cost-effectiveness is determined by dividing the annualized costs of a project by the annual weighted emission reductions offered by the project.

**Table 5.2 – Capital Recovery Factors (CRF) for Various Project Lives  
At 4 Percent Discount Rate**

Project Life	CRF
3	0.360
4	0.275
5	0.225
6	0.191
7	0.167
8	0.149
9	0.134
10	0.123
11	0.114
12	0.107
13	0.100
14	0.095
15	0.090
16	0.086
17	0.082
18	0.079
19	0.076
20	0.074

## POTENTIAL PROJECTS

All eligible projects must use certified technology or technology that has been verified by the ARB for real and quantifiable emission reductions that go beyond any regulatory requirement.

Off-road projects fall into three distinct categories: 1) new purchase of an emission certified engine, 2) repower with an emission certified engine, and 3) retrofit with a verified diesel emission control strategy (DECS).

Auxiliary engines on mobile equipment are considered portable engines and are regulated by the ARB's Portable Equipment Air Toxics Control Measure (ATCM). Auxiliary engines that are an integral part of the vehicle's or vessel's main function, and are not covered under any district rule may be eligible for Carl Moyer funding. Because the ATCM requires that all portable engines be certified engines by January 1, 2010, projects must begin by January 1, 2007 to meet the minimum three year project life

requirement [ARB, 2004a].

Class 7 diesel forklifts are the only diesel forklifts eligible for Carl Moyer Program funding and are subject to all off-road project criteria. The district must obtain and verify documentation of the classification of the forklift prior to funding. Class 7 forklifts typically have a lift capacity of over 6,000 pounds, pneumatic tires, and internal combustion, compression ignition engines powered almost exclusively by diesel. Many of the characteristics of these forklifts, including pneumatic tires for rough terrain, make them exclusively for outdoor use.

#### **A. New Purchase**

For most engine categories, the current standard is Tier 2 or Tier 3 with an optional Blue Sky Standard that applies through Tier 3. However, at this time, no engines have been certified to the Blue Sky standard. New equipment having an engine that was certified to any FEL level is not eligible for *new* purchase in the Carl Moyer Program. This is because the emission level from an eligible FEL engine in the new equipment would be considered to be at the level of the required emission standard for that engine, through the averaging provision of the ABT program discussed previously. Therefore, the emissions from an FEL engine in the new equipment would not be surplus when compared to the emissions from a new engine meeting the required emission standards.

For some off-road equipment such as yard tractors, it may be possible to purchase new equipment with a new on-road engine certified to ARB's optional NOx emission credit standard instead of a new off-road engine. Where this is the case, emission benefits relative to the baseline engine are calculated based on on-road engine emission factors. If an applicant provides ARB with documentation showing that in past practice, the fleet has been powered by off-road engines, then the baseline emission may be calculated using the off-road engine emission factors.

#### **B. Repower**

Replacement of the in-use engine (i.e., repower) with an emission-certified engine instead of rebuilding the existing engine to its original uncontrolled specifications is the most common type of off-road project. Although this is commonly a diesel-to-diesel repower, significant NOx and PM benefits are achieved due to the high emission levels of the uncontrolled engine being replaced. Eligible engines are those that are certified to the current applicable emission standard or to an optional credit emission standard. For off-road equipment with similar modes of operation to on-road vehicles, other possible options include the replacement of an older uncontrolled diesel off-road engine with a new or rebuilt on-road engine certified to an emission standard equal to or cleaner than the Tier 2 off-road emission standard or a newer emission-certified alternative fuel engine.

Repower projects must utilize a newer engine meeting current applicable emission standards (i.e., Tier 2 or Tier 3). If this is not a technical or practical option, as determined by the engine manufacturer, a newer emission-certified engine that meets the Tier 1 standards may be used. Off-road CI engines have undergone major design changes to meet new and more stringent emission regulations. Off-road engine

manufacturers have made significant hardware modifications in order to meet the Tier 2 emission standards for engines with horsepower rating of 100 hp and greater. The incorporation of air-to-air aftercoolers and other auxiliary systems have resulted in Tier 2 engines for some applications that are physically different than the earlier Tier 1 engines. As a result, some existing equipment cannot accept Tier 2 engines without extensive modifications. This may involve cutting the equipment frame to gain adequate space for the Tier 2 engine. In these situations, technical, cost, and safety considerations make a new Tier 2 engine repower infeasible. Thus, the use of a newer emission-certified engine meeting the earlier Tier 1 emission standard may be justified. Specific information on the eligibility of these projects is further described in the project criteria.

**In addition, CARB requires that all repower projects funded by the Moyer Program install a retrofit device if one is available.** ARB staff requires that the highest level<sup>3</sup> ARB-verified retrofit device be installed for retrofit projects if the project meets the cost effectiveness limit of \$14,300 per weighted ton<sup>4</sup>. If a Level 3 device is not feasible or does not meet the cost-effectiveness limit, a Level 2 device must be installed; if no Level 3 or Level 2 devices are feasible, a Level 1 device must be installed. Newly verified systems are continually being added. It is the applicant's responsibility to consult the CARB VDECS website<sup>5</sup> and determine applicability of newly verified systems. Applications for repowers that do not include eligible VDECS may be rejected by AQMD for evaluation. However, repower projects are not disqualified from participation in the Moyer Program if retrofit devices are not feasible or if the added cost of the available retrofit places the project over the \$14,300 per ton CMP cost-effectiveness limit.

Funding is not available for projects where a spark-ignition engine (i.e., natural gas, gasoline, etc.) is replaced with a diesel engine.

### **C. Retrofit**

Retrofit refers to modifications made to an engine and/or fuel system such that the specifications of the retrofitted engine are not the same as the original engine; please refer to Appendix F for more detailed information. The most straightforward retrofit projects are add-on after treatments. Other retrofits include upgrades of components that can be accomplished at the time of engine rebuild and result in a lower emission configuration. To qualify for Carl Moyer Program funding, the retrofit technology must be verified for sale in California and must comply with established durability and warranty requirements. Retrofits are verified for diesel PM reductions of: Level 1 (25

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<sup>3</sup> CARB guidance requires the applicant to select the highest level technology that provides the most emission reductions. For many on-road projects, this includes a diesel emission control device that reduces both PM and NOx emissions. In order to be eligible for CMP funding, the retrofit device must be verified for the specific engine family found on the equipment and achieve the highest level emission reductions when compared to other verified retrofit devices.

<sup>4</sup> Note that repower projects that require a VDECS will first be evaluated as a repower-only project to determine project cost-effectiveness (not to exceed \$5,000 per weighted ton) and ranking. Once selected for award, the added cost of the VDECS will be included in the grant award recommendation.

<sup>5</sup> <http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>

percent), Level 2 (50 percent), and Level 3 (85 percent). Retrofit technology options for off-road diesel engines are increasing and the applicant will find more information on VDECS, including a list of currently verified DECS, at <http://www.arb.ca.gov/diesel/verdev/verdev.htm>.

## **PROJECT CRITERIA**

Participating districts retain the authority to impose more stringent additional requirements in order to address local concerns.

### **A. General**

- Off-road CI equipment eligible for Carl Moyer Program funding includes equipment 25 hp (19 kilowatt) or greater such as construction and agricultural equipment. This also includes auxiliary engines found on off-road equipment, marine vessels, and on-road vehicles. Excluded from this discussion are engines that propel or are used on locomotives, marine vessel propulsion, and most forklifts (except for class 7 forklifts) which are discussed in other Appendices.
- Emission reductions obtained through Moyer Program projects must not be required by any federal, state or local regulation, memorandum of agreement/understanding with a regulatory agency, settlement agreement, mitigation requirement, or other legal mandate.
- No emission reductions generated by the Moyer Program shall be used as marketable emission reduction credits, or to satisfy any emission reduction obligation of any person or entity.
- No project funded by the Moyer Program shall be used for credit under any federal or state emission averaging, banking, and trading program.
- Moyer Program grants can be no greater than a project's incremental cost. The incremental cost is the cost of the project minus the baseline cost. The incremental cost shall be reduced by the value of any current financial incentive that reduces the project price, including, but not limited to, tax credits or deductions, grants, or other public financial assistance.
- Projects must have a minimum project life of three years. ARB may approve a shorter project life in writing for good cause on a case-by-case basis. Projects with shorter lives may be subject to additional funding restrictions, such as a lower cost-effectiveness limit or a project cost cap.
- The contract term must extend to the end of the project life.
- Potential projects that fall outside of these criteria may be considered on a case-by-case basis if evidence provided to the air district suggests potential surplus, real, quantifiable and enforceable emission reduction benefits.
- The certification emission standard and Tier designation for the engine must be determined from the Executive Order issued for that engine, not by the engine model year. Executive orders for off-road engines may be found at <http://www.arb.ca.gov/msprog/offroad/cert/cert.php>

- Reduced-emission engines or retrofits must be certified/verified for sale in California and must comply with durability and warranty requirements. These may include new ARB certified engines, ARB certified after-market part engine/control devices, and verified diesel emission control strategies.
- Engines participating in the ABT program that are certified to FELs higher than the applicable emission standards, as designated on the Executive Order, are not eligible to participate in the Moyer Program, *unless this is a repower project and the emission standard (and not the FEL) is used for the emission reduction calculation.*
- Equipment manufactured under the “Flexibility Provisions for Equipment Manufacturers”, as detailed in Title 13, CCR, section 2423(d), are ineligible for Carl Moyer funding.
- Engines that are participating in the “Tier 4 Early Introduction Incentive for Engine Manufacturers” program, as detailed in Title 13, CCR, section 2423(b)(6), are ineligible for Carl Moyer funding.
- Class 7 diesel forklifts are the only diesel forklifts eligible for Carl Moyer funding and are subject to all off-road project criteria. The district must obtain and verify documentation of the classification of the forklift prior to funding.
- Funded projects must operate at least 75 percent of total equipment operation hours in the South Coast Air Basin.
- Maximum project life

Off-road new purchase	10 years
Off-road repower	7 years
Off-road repower and retrofit	5 years
Retrofit	5 years

Applicants must provide documentation to justify a longer project life.

#### **B. New Purchase**

- Engines must be certified to CARB optional NOx or NOx+NMHC emission credit standard for off-road diesel engines that is at least 30 percent lower than current applicable emission standards or for some equipment, such as yard tractors, an on-road engine certified to ARB’s optional NOx emission credit standard
- Engines that are certified to FEL levels are not eligible for funding in new equipment purchase projects.

#### **C. Repower**

- For repower projects that replace uncontrolled engines in existing equipment, the replacement engine must be certified to either: 1) the current applicable emission standard except as noted below, 2) to a FEL NOx or NOx+NMHC level that is lower than the required emission standard, or 3) to an optional credit emission

standard as applicable for the horsepower rating.

- For equipment repower projects that replace emission-certified engines in existing equipment, the replacement engine must be certified to a NOx emission standard that is at least 15 percent lower than the emission standard(s) applicable to the existing engine.
- Engines used in equipment repower projects may be new, emission-certified rebuilt, or emission-certified remanufactured units. Eligible new engine are those offered by the original equipment manufacturer (OEM) or by a non-OEM who demonstrates to the ARB that the repower is functionally equivalent with regard to emissions, durability, and safety as described in Appendix G. Eligible rebuilt or remanufactured engines are those offered by the OEM or by a non-OEM rebuilder who demonstrates to the ARB that the rebuilt engine and parts are functionally equivalent from an emissions and durability standpoint to the original engine and components being replaced as described in Appendix G. Rebuilt and remanufactured engines that are not re-certified to new emission standards shall use the emission standards associated with the original engine block.
- ARB strongly recommends that districts give priority to Tier 2 or Tier 3 repowers. However, ARB recognizes that in some cases repower with the current applicable standard is not possible. In these cases a Tier 1 repower may be allowed if the conditions below are met and the project meets a project cost-effectiveness cap of \$6,000 per weighted ton of emission reductions for the repower portion of the project. Tier 1 repowers of specialty equipment not meeting the project cost-effectiveness cap may be allowed on a case-by-case basis. AQMD will consider Tier 1 repower projects only if sufficient funding is available.
- If repower with an engine meeting the current applicable standard is technically infeasible, unsafe, or cost prohibitive, the replacement must meet the most current practicable previously applicable emission standard. The district shall determine eligibility of a Tier 1 engine repower project on a case-by-case basis by obtaining a Tier 2/Tier 3 repower exemption.

For a Tier 2/Tier 3 repower project to be eligible, the Carl Moyer Program application may include a written statement of reason(s) from the engine manufacturer verifying that a particular piece of equipment cannot accommodate an engine meeting current standards without major modifications, safety risks, or exorbitant cost. The letter must include information on the equipment being repowered, the engine being replaced, the reason why an engine meeting the currently applicable standard cannot be used (including details on required equipment modifications with pictures of the equipment, engineering drawings as necessary, and cost for the Tier 2/Tier 3 engine), and the proposed Tier 1 replacement engine. Districts must submit the written statement of reason(s) to ARB as an attachment to the annual report.

- If an ARB-verified diesel emission control strategy is available for the replacement engine, ARB requires installation of the retrofit verified to the highest level, as discussed in the retrofit section of these project criteria, which still meets

the overall CMP cost-effectiveness limit of \$14,300.

- For repowers of equipment with baseline engines manufactured under the flexibility provision, as detailed in Title 13, CCR, section 2423(d), baseline emission rates shall be determined by using the latest applicable Tier emission standard for that engine model year and horsepower rating. Alternative emission rates will be allowed with documentation of the actual emission rates from the manufacturer based on the engine serial number. Districts must submit all documentation to ARB as an attachment to the annual report.
- Replacement of an uncontrolled diesel off-road engine with a new or rebuilt on-road engine certified to an emission standard equal to or lower than the Tier 2 off-road emission standard or a newer emission-certified alternative-fuel engine is eligible for funding in off-road equipment with similar modes of operation to on-road vehicles. Other equipment may be eligible for funding on a case-by-case basis. These repowers must meet all other applicable project criteria.

#### **D. Retrofit**

- Only ARB-verified retrofits are eligible for funding. Emerging engine retrofits will become eligible for Program participation once ARB grants verification for sale in California. Non-verified technologies may be considered on a case by case basis if: 1) an application for verification of the retrofit or add-on equipment on the proposed engine category is pending or 2) for highly specialized equipment where it is unlikely that a retrofit would be verified.
- Retrofit projects that control PM must use the highest level<sup>6</sup> ARB-verified technology available for the equipment being retrofitted.
- Retrofit projects that control NOx must reduce NOx emissions from uncontrolled engines to the current applicable emission standard. If this is not feasible, the project must reduce NOx to at least the applicable Tier 1 NOx emission level (6.9 g/bhp-hr or lower). For emission-certified engines, the retrofit technology must be able to reduce NOx emissions by at least 15 percent.
- The cost of the retrofit, filters, and maintenance of the retrofit device needed during the project life may be paid for with incentive funding provided it meets the cost-effectiveness limit.

#### **E. Scrap**

- Scrap requirements are described in the 2005 Carl Moyer Program Guidelines, Part I, Chapter 2: Administration of the Carl Moyer Program.

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<sup>6</sup> CARB guidance requires the applicant to select the highest level technology that provides the most emission reductions. For many on-road projects, this includes a diesel emission control device that reduces both PM and NOx emissions. In order to be eligible for CMP funding, the retrofit device must be verified for the specific engine family found on the equipment and achieve the highest level emission reductions when compared to other verified retrofit devices.

## **VI. Cost-Effectiveness**

Emission reduction benefits represent the difference in the emission levels of the existing baseline technology relative to the newer, reduced-emission technology. Baseline and reduced engine emission factors are listed in Table B-12 in CARB's CMP Guidelines, Part IV, Appendix B. These factors reflect preliminary emission data based on model input values to the OFFROAD emission inventory model for engines greater than or equal to 25 hp.

A detailed description of how to calculate cost-effectiveness can be found in CARB Guidelines, Part IV, Appendix C. Off-road emission reduction calculations will use either the fuel or hour based formula as discussed Appendix C. The equipment activity level must be based on actual hours reading from an hour-meter or other similarly appropriate documentation provided by the applicant (i.e. fuel receipts). Future annual hours of equipment operation for determining emission reductions must be based only on readings from an installed and fully operational hour-meter. A properly functioning hour-meter is required to support equipment activity information included in the application for Moyer Program funding. In addition, specific cost-effectiveness criteria and sample calculations for off-road projects may be found in Section V of Appendix D.